Amendments to the claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of claims

1 – 35 (cancelled)

36. (new) A method for catalytic combustion of a low concentration fuel comprising:

compressing a substantially constant low concentration inlet fuel at a compression ratio of no greater than 3.5 to form a compressed fuel;

pre-heating the compressed fuel to form a pre-heated compressed fuel;

combusting the pre-heated compressed fuel in the presence of a catalyst at a combustion temperature of no greater than 800°C to form a gas stream; and

expanding the gas stream in a turbine, at least part of said gas stream being recirculated, after expansion, for pre-heating of said compressed fuel.

37. (new) A method as claimed in claim 36, wherein said inlet fuel is compressed at a compression ratio of 1.5 to 3.5.

38. (new) A method as claimed in claim 36, wherein said inlet fuel is compressed at a compression ratio of approximately 2.

39. (new) A method as claimed in claim 36, wherein said compressed fuel has a temperature of 100 to 200°C prior to pre-heating.

40. (new) A method as claimed in claim 39, wherein the compressed fuel is pre-heated to a temperature of 475 to 535°C.

41. (new) A method as claimed in claim 36, wherein said gas stream resulting from combustion of said pre-heated compressed fuel has a temperature of approximately 780°C and said at least part of said gas stream being recirculated, after expansion, for pre-heating of said compressed fuel has a temperature of approximately 630°C.

42. (new) A method as claimed in claim 36, wherein said inlet fuel comprises a gas with a methane concentration of 0.5 to 1.5 mole%.

43. (new) A method as claimed in claim 36, wherein said inlet fuel comprises a gas with a methane concentration of approximately 1 mole%.

44. (new) A method as claimed in claim 42, wherein said inlet fuel comprises a mixture of a first gas and a second gas, said method further comprising mixing said first gas and said second gas to form said substantially constant low concentration inlet fuel.

45. (new) A method as claimed in claim 44, wherein said first gas has a methane concentration of 0 to 1.5 mole% and said second gas has a methane concentration of over 20 mole%.

46. (new) A method as claimed in claim 44, wherein said first gas is ventilation air from an underground coal mine and said second gas is drainage gas from an underground coal mine.

47. (new) A method as claimed in claim 46, further comprising scrubbing said ventilation air and said drainage gas prior to mixing.

48. (new) A method as claimed in claim 47, wherein said scrubbing removes particles of greater than and equal to 0.5 micron in diameter from said ventilation air and said drainage gas.

49. (new) A method as claimed in claim 48, wherein said scrubbing removes sulfur compounds from said ventilation air and said drainage gas respectively, such that the concentration of hydrogen sulfide in said first gas and said second gas after scrubbing is no greater than 10ppm and that the concentration of sulfur dioxide in said first gas and second gas after scrubbing is no greater than 5ppm.

50. (new) A method as claimed in claim 36, further comprising converting turbine shaft work resulting from expansion of said gas stream in said turbine to electricity using a generator.

51. (new) A method as claimed in claim 50, wherein at least a portion of said electricity generated is used to power a compressor used for compression of said inlet fuel.

52. (new) A catalytic combustion system comprising:

a compressor for compressing a substantially constant low concentration inlet fuel;

a pre-heater in fluid communication with said compressor, said pre-heater receiving compressed fuel from said compressor;

a catalytic combustor in fluid communication with said pre-heater, said catalytic combustor receiving pre-heated compressed fuel from said pre-heater and combusting same in the presence of a catalyst; and

a turbine in fluid communication with said catalytic combustor and said pre-heater, said turbine receiving a gas stream resulting from combustion of the pre-heated compressed fuel, at least part of said gas stream being recirculated from said turbine to said pre-heater;

wherein said compressor operates at a compression ratio of no greater than 3.5 and wherein said gas stream received by said turbine has a temperature of less than 800°C.

53. (new) A system as claimed in claim 52, wherein said compressor operates at a compression ratio of 1.5 to 3.5.

54. (new) A system as claimed in claim 52, wherein said compressor operates at a compression ratio of approximately 2.

55. (new) A system as claimed in claim 52, wherein said inlet fuel comprises a mixture of a first gas and a second gas, said system further comprising a mixer for mixing said first gas and said second gas.

56. (new) A system as claimed in claim 55, further comprising a reservoir disposed between said mixer and said compressor, said reservoir containing a mixture of said first and second gases and acting as a buffer to possible fluctuations in fuel concentration of said first and second gases, thereby ensuring the supply of said substantially constant, low concentration inlet fuel to said compressor.

57. (new) A system as claimed in claim 55, wherein said first gas is ventilation air from an underground coal mine and said second gas is drainage gas from an underground coal mine.

58. (new) A system as claimed in claim 57, further comprising a first scrubber for scrubbing said ventilation air and a second scrubber for scrubbing said drainage gas.

59. (new) A system as claimed in claim 58, wherein said first and second scrubbers remove particles of greater than and equal to 0.5 micron in diameter from said ventilation air and said drainage gas, and wherein said first and second scrubbers remove sulfur compounds from said ventilation air and said drainage gas respectively, such that the concentration of hydrogen sulfide in gas outlet streams of the first and second scrubbers is no greater than 10ppm and that the

concentration of sulfur dioxide in gas outlet streams of the first and second scrubbers is no greater than 5ppm.

60. (new) A system as claimed in claim 52, wherein said catalytic combustor contains a catalyst having an activity of $50x10^{-7}$ to $200x10^{-7}$ mole/m^2s and a reaction surface area of 20 to 40 m^2/cm^2.

61. (new) A system as claimed in claim 60, wherein said catalytic combustor is a honeycomb-type monolith catalytic combustor.

62. (new) A system as claimed in claim 61, wherein said honeycomb-type monolith catalytic combustor comprises a ceramic monolith which acts as a substrate for a wash coat slurry of base metals on which a noble metal catalyst is placed.

63. (new) A system as claimed in claim 52, further comprising a pre-burner in fluid communication with said pre-heater and said catalytic combustor, said pre-burner having a start up fuel inlet that, during start up of said system, supplies a start up fuel to said pre-burner which is combusted to heat compressed fuel received from said compressor, via said pre-heater, to provide heated compressed fuel to the catalytic combustor during start up of the system.

64. (new) A system as claimed in claim 52, wherein said compressed fuel has a temperature of 100 to 200°C prior to pre-heating, and wherein the compressed fuel is pre-heated to a temperature of 475 to 535°C.

65. (new) A system as claimed in claim 52, wherein said gas stream resulting from combustion of said pre-heated compressed fuel has a temperature of approximately 780°C and said at least part of said gas stream being recirculated, after expansion, for pre-heating of said compressed fuel has a temperature of approximately 630°C.

66. (new) A catalytic combustion system for combustion of ventilation air and drainage gas from an underground coal mine, said system comprising:

a first scrubber for scrubbing ventilation air received from the underground coal mine and a second scrubber for scrubbing drainage gas received from the underground coal mine;

a mixer located down stream of said first scrubber and said second scrubber for mixing said drainage gas with said ventilation air;

a controller for controlling the amount of drainage gas mixed with said ventilation air such that a fuel mixture comprising a substantially constant concentration of 0.5 to 1.5 mole% methane is emitted from the mixer;

a reservoir located down stream of said mixer, said reservoir containing the fuel mixture emitted from the mixer and acting as a buffer to possible fluctuations in fuel concentration of said ventilation air and said drainage gas, thereby ensuring the supply of a substantially constant low concentration fuel;

a compressor for compressing said substantially constant low concentration fuel, said compressor operating at a compression ratio of no greater than 3.5;

a pre-heater in fluid communication with said compressor, said pre-heater receiving compressed fuel from said compressor;

a catalytic combustor in fluid communication with said pre-heater, said catalytic combustor receiving pre-heated compressed fuel from said pre-heater and combusting same in the presence of a catalyst; and

a turbine in fluid communication with said catalytic combustor and said pre-heater, said turbine receiving a gas stream having a temperature of less than 800°C resulting from combustion of the pre-heated compressed fuel, at least part of said gas stream being recirculated from said turbine to said pre-heater.